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Science Advisory Report 2012/020

STOCK STATUS ASSESSMENT OF LOBSTER ON THE NORTH SHORE (LFAS 15, 16 AND 18) AND AT ANTICOSTI ISLAND (LFA 17), QUEBEC, IN 2011

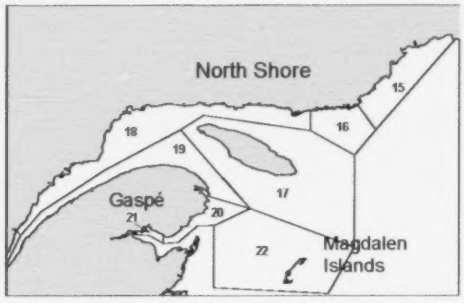

Figure 1: Map showing lobster fishing areas (LFAs) in Quebec (LFAs 15 to 18: North Shore and Anticosti, LFAs 19 to 21: Gaspé Peninsula and LFA 22: Magdalen Islands).

Context

The lobster fishery along Quebec's North Shore is practiced by some forty fishermen covering 3 lobster fishing areas (LFA 15, 16 and 18) (Figure 1). Most of the North Shore fishermen are in LFA 15 (around 40). There are 5 fishermen in LFA 16 and only 1-3 fishermen in LFA 18, depending on the year, in sub-areas G and H (Figure 2). The lobster fishery at Anticosti Island is practiced by 15 fishermen that come from the Middle North Shore, Gaspé Peninsula and Magdalen Islands. They are spread out primarily around the Island's easternmost tip in sub-area 17B (Figure 3). The lobster harvested at Anticosti Island is landed at ports from which the fishermen originate.

The lobster fishery is managed by controlling the fishing effort (number of licences, number and size of traps and fishing season) and by escapement measures: release of berried females and minimum legal size (MLS). The management and conservation measures introduced over the past 15 years follow the recommendations of the Fisheries Resource Conservation Council (FRCC). The resource status is assessed every three years. This report describes the situation in 2011 and the changes observed since the last stock status assessment in 2008.

SUMMARY

- Lobster landings on the North Shore in LFA 15 were 14 t in 2011, which represents a drop of 22% compared to 2008 and 44% compared to the average of the past 25 years. In LFA 16, landings have been stable since 2008 at about 6 t, which is less than 46% of the average of the past 25 years (11 t). However, information on landings may not be complete. Catches per unit effort remained relatively stable from 2008 to 2011. The fishing effort deployed was low and corresponds to only 13% of the effort permitted.

- At Anticosti Island, in LFA 17B, landings have risen since 2008, peaking (205 t) in 2010. They were 174 t in 2011, which is 11% greater than in 2008 and 48% above the average of the past 25 years. In 2011, catches per unit effort (CPUE) from logbooks were 32% greater than those in 2008.

- Few lobsters were measured over the past few years in LFAs 15 and 16, which makes it difficult to assess demographic indicators. In LFA 17B, lobster size structures have changed considerably in recent years, becoming more truncated. The smaller mean size suggests the arrival of recruitment. However, the sharp drop in the proportion of jumbos (≥ 127 mm carapace length, CL) suggests exploitation has increased. Mean and maximum sizes of females have also decreased since 2008, suggesting weaker egg production.

- Although abundance is currently high in LFA 17B, the demographic changes are not negligible. If these changes intensify in the future, the fishery will likely become increasingly dependent on annual recruitment. In addition, fishing pressure will increase on immature lobster, affecting the population's reproductive potential. Additional information would be necessary to better assess stock status on the Lower North Shore (LFAs 15 and 16).

- Lobster populations on the Lower North Shore and at Anticosti Island are characterized by slow growth and late sexual maturity, making them more vulnerable to over-harvesting. It is recommended that the minimum legal size be increased to be closer to the size at sexual maturity in order notably to minimize the impacts of increased fishing pressure in Area 17B.

INTRODUCTION

Biology

American lobster (*Homarus americanus*) occurs along the west coast of the Atlantic Ocean, from Labrador to Cape Hatteras. Adult lobsters prefer rocky substrates where they can find shelter, but can also live on sandy and even muddy bottoms. Commercial concentrations are generally found at depths of less than 35 m. On the North Shore and Anticosti Island, females reach sexual maturity at sizes above 90 mm CL. Additional information would help get a precise estimation. Elsewhere in Québec, in more southern areas, females reach sexual maturity earlier (79-84 mm). Males reach sexual maturity at a smaller size. Females generally have a two-year reproductive cycle, spawning one year and moulting the next. Females spawning for the first time can produce nearly 8 000 eggs while large females measuring 127 mm CL (jumbo size) can lay up to 35 000 eggs. In addition to being more fertile, certain large females could spawn for two consecutive years before moulting. Once released, the eggs remain attached to the females' swimmerets for 9 to 12 months, until the planktonic larvae hatch the following summer. Spawning and hatching can occur earlier in the season for multiparous females (females spawning for the second time at least) than for primiparous females. It was also noticed that larvae at the time of release could be larger for multiparous females than for primiparous females. The larvae's planktonic phase lasts from 3 to 10 weeks, depending on the temperature of the water. Following metamorphosis, postlarval lobsters (stage IV), which now resemble adult lobsters, drift down from the surface layer to settle on the sea floor. The survival of lobster from their larval stage to their initial benthic stages is impacted by predation as well as by hydrodynamic factors that cause advection or retain the larvae near the areas that are favourable for benthic settlement. During the first few years of benthic life, until they reach approximately 40 mm, lobsters lead a cryptic existence; i.e. they live hidden in habitat

providing many shelters. In more southern areas, such as in the Magdalen Islands, lobsters are estimated to reach the minimum legal size (83 mm) at around eight or nine years of age after having moulted approximately 16 times since their benthic settlement. Recruitment to the fishery could be delayed in more northern areas because of slower growth (smaller moult increment and lower moulting frequency).

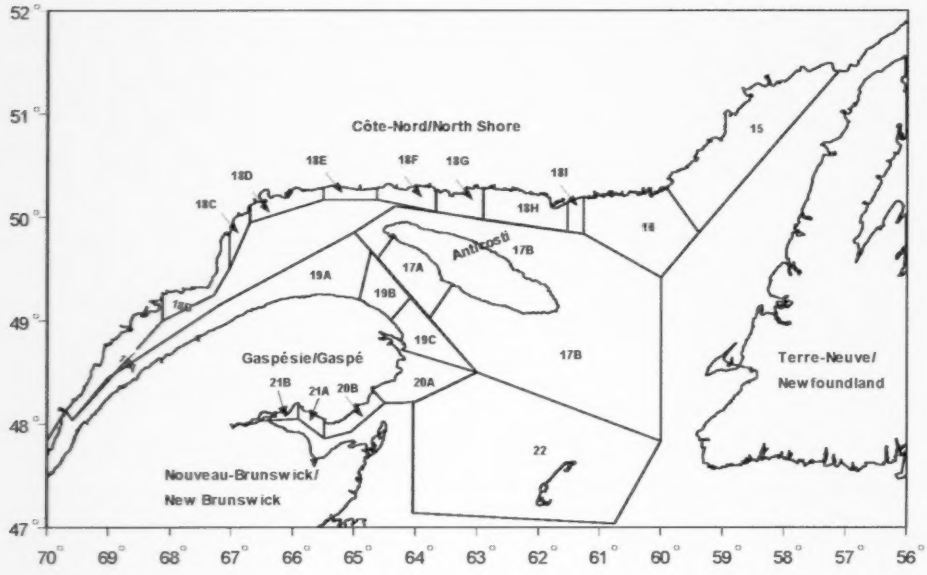

Figure 2. Lobster fishing areas (LFAs) on the Lower North Shore (LFAs 15 and 16), Upper and Middle North Shore (LFA 18, A to I) and at Anticosti Island (LFAs 17A and 17B).

Description of the Fishery

The lobster fishery is managed by controlling fishing effort that restricts the number of licences, the number and size of traps and the duration of the fishing season. In 2011, there were 38, 4 and 3 active fishers in LFAs 15, 16 and 18 respectively. Fourteen of fifteen fishers were active at Anticosti Island (17B) in 2011. One exploratory licence was also issued in LFA 17A. The number of traps is limited to 250 on the North Shore and 300 at Anticosti Island. Fishers may use traps that are larger than the standard size. However, the number of these traps is limited to 175 (North Shore) or 210 (Anticosti). The presence of escape vents on traps has been mandatory since 1994 and the size of their vertical opening was increased from 43 mm to 46 mm in 2004 (LFAs 15 and 16), and to 47 mm in 2003 (LFA 17) and 2004 (LFA 18). The lobster fishery is a spring fishery lasting ten (LFA 17) or twelve weeks (LFAs 15, 16 and 18). Fishery management also includes escapement measures. In addition to having a minimum legal size (MLS), berried females must be released. The MLS was increased in 1998 to double egg production per recruit. It has been at 82 mm since 2005 in LFAs 15 and 16, and at 83 mm since 2003 in LFAs 17 and 18. It was at 76 mm from 1957 to 1997.

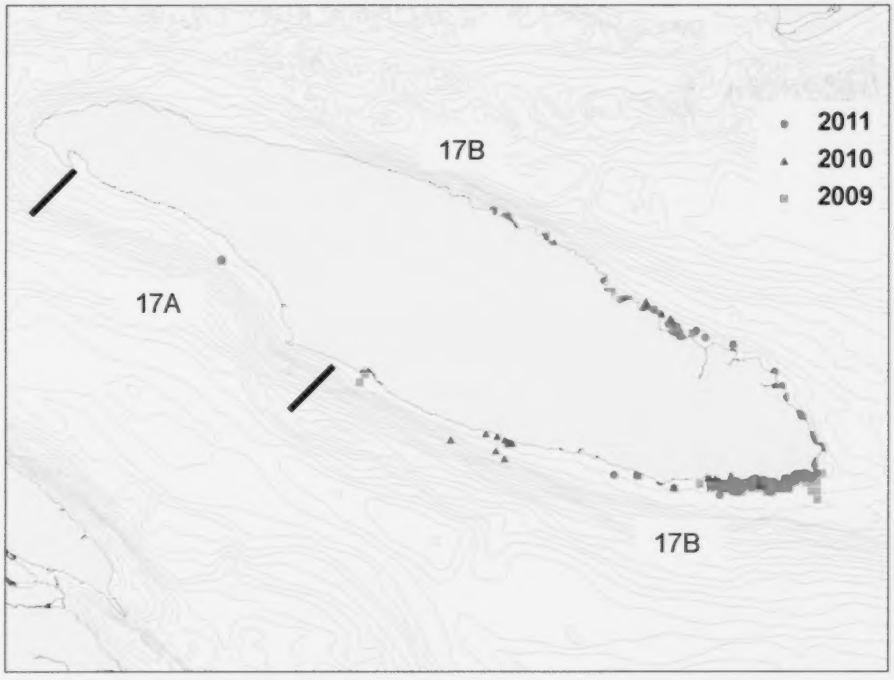

Figure 3. Map of Anticosti Island indicating fishing effort distribution in LFA 17 between 2009 and 2011.

STOCK STATUS ASSESSMENT

Source of Data

The stock status assessment is conducted for stocks in LFAs 15, 16 and 17B only. The assessment is based on abundance and demographic indicators. Given that there is no at-sea sampling or fishery-independent surveys for these stocks, fishing pressure and productivity (reproduction and recruitment) are not evaluated as in other Quebec LFAs (19-22). Abundance indicators include the landings recorded on processing plant purchase slips and catch rates of commercial-size lobsters obtained from at-sea and dockside sampling and from logbooks filled out by fishermen on a voluntary basis first and then on a mandatory basis since 2004 in LFA 17B and since 2007 in LFAs 15 and 16. Demographic indicators are taken from size structure analysis of lobsters and include mean size, jumbo abundance (≥ 127 mm) and sex-ratio. For LFAs 15 and 16, these indicators are compiled from at-sea (1993-2004) and dockside (since 2005) sampling data. Sampling is conducted in the La Tabatière and Tête-à-la-Baleine (LFA 15) and La Romaine (LFA 16) sectors. For LFA 17B, sampling has been conducted dockside since 1998 at North Shore and Gaspé Peninsula ports of landing. For each indicator, data from the three previous years are examined and the 2011 data compared to averages from the existing data series prior to that year.

Abundance Indicators

Landings

Lobster landings in LFA 15 were 14 t in 2011, which represents a drop of 22% compared to 2008 and 44% compared to the average of the past 25 years, or 25 t (Figure 4). In LFA 16, landings have been stable since 2008 at about 6 t, which is less than 46% of the average for the past 25 years (11 t) (Figure 4). Landings from the North Shore account for 1% of Quebec landings. However, landing data may be incomplete. The fishing effort deployed in these areas is somewhat weak. The average number of traps hauled per fisher estimated based on logbook data represents only 13% of the effort permitted. Less than 20% of the traps are hauled on a daily basis and over 40% are hauled only every 3-4 days.

Landings at Anticosti Island (LFA 17B) have increased since 2008, peaking at 205 tons in 2010 (Figure 4). They were 174 t in 2011, which is 11% higher than in 2008 and 48% above the average of the past 25 years (125 t). Landings from LFA 17B account for 4% of Quebec landings. Most traps are hauled on a daily basis (73 %) or after two days of immersion (91%).

It should be noted that data for LFA 18 may be incomplete and since 2006, landings total around 1 t (Figure 4).

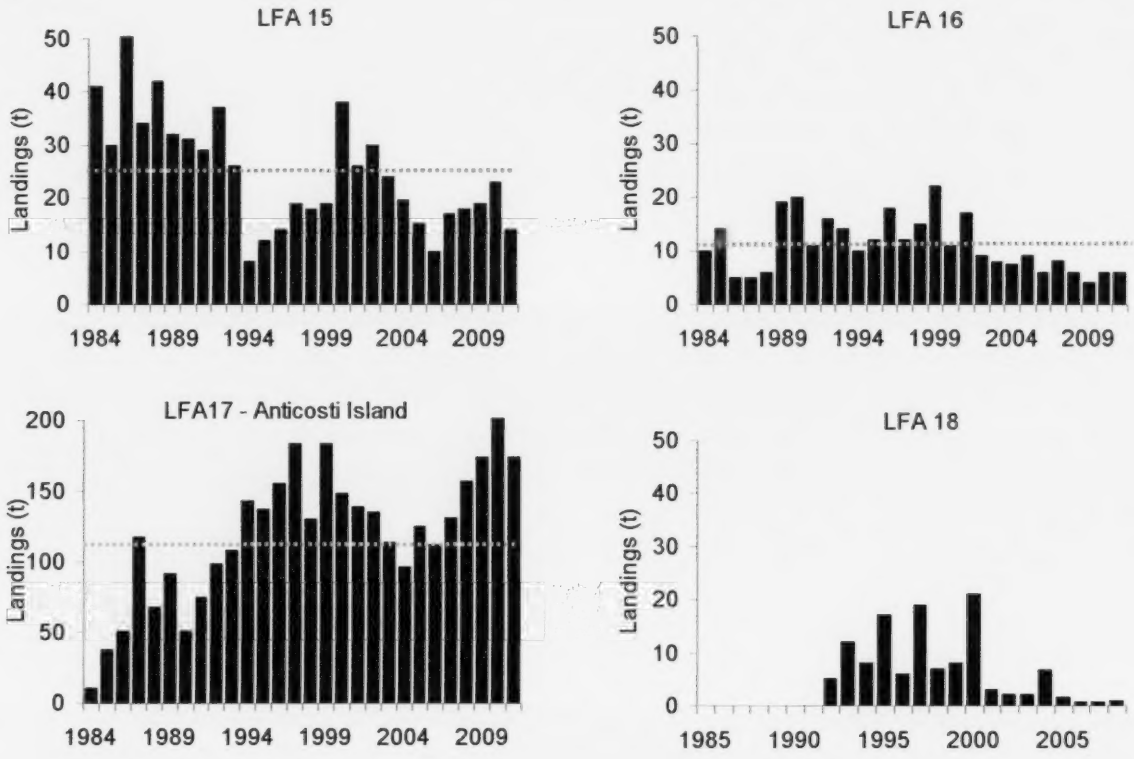

Figure 4. Lobster landings on the North Shore (LFAs 15, 16 and 18) and at Anticosti Island (LFA 17B) from 1984 to 2011. The dotted lines represent the average value for the 1984-2010 period.

Catch Rates for Commercial Lobster

Catch rates correspond to the catches per unit of effort (CPUE) expressed in number or weight of lobster per trap. In 2011, catches per unit effort (CPUE) from at-sea sampling data in LFAs 15 and 16 combined were 0.27 lobsters per trap (l/trap) and 0.2 kg/trap (Figures 5A and B). These values are very similar to what was observed in 2008. In 2011, catch rates were lower in number (16%) but higher in weight (11%) than the average for the 1993-2010 period (0.32 l/trap and 0.18 kg/trap). The CPUE increase in weight (despite a decline in CPUE in number) is in all likelihood a positive effect of increasing the minimum legal size (6 mm increase between 1998 and 2005). In 2011, the average CPUE (in weight) estimated from data in logbooks completed by 42 fishers in LFAs 15 and 16 was 0.22 kg/trap. It has varied between 0.19 and 0.22 kg/rap since 2008. CPUE values from both data sources are similar (Figure 5B), except for the peak observed in 2010 using sampling data but not shown with the logbooks. This may be due to an artifact of the commercial sampling since it is only conducted on a few occasions and covers less than 1% of fishing trips. Sampling in 2010 was particularly low.

In LFA 17B, CPUEs reached 1.1 kg/trap in 2011, which represents the highest value (with 2010) since 2006. The 2011 CPUE was 32% higher than in 2008 (0.82 kg/trap) (Figure 5C).

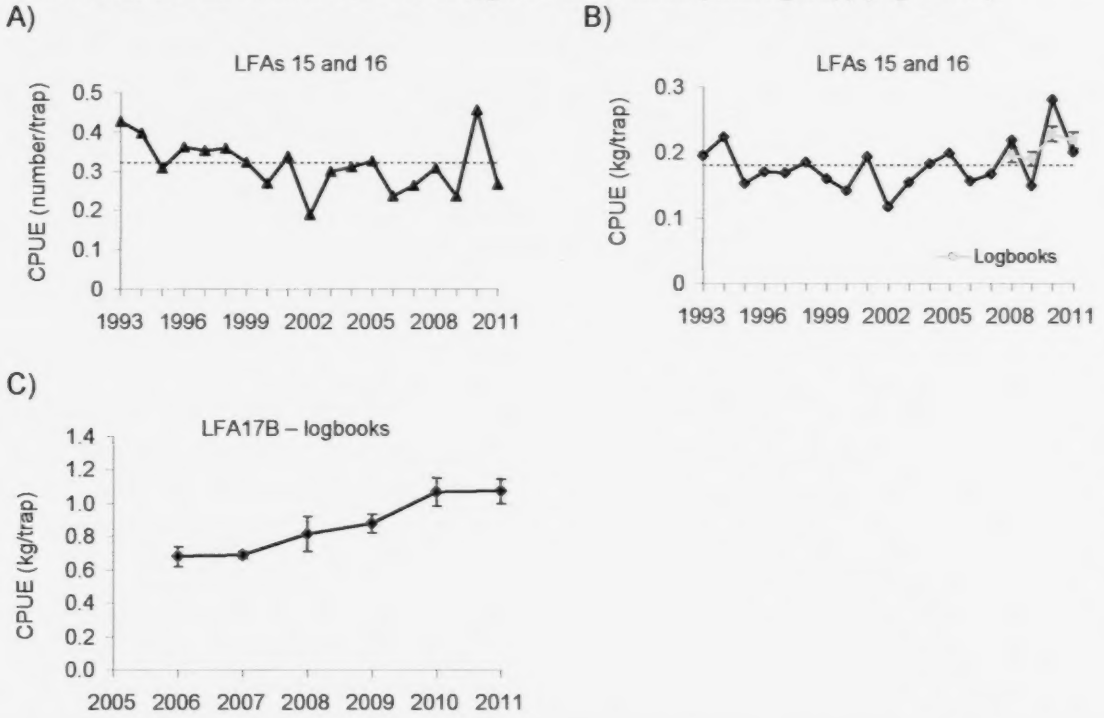

Figure 5. Catch rates (CPUEs) of commercial-size lobster in LFAs 15 and 16 on the Lower North Shore from 1993 to 2011 in number (A) and in weight (B) per trap and for LFA 17B in weight per trap (C). For A) and B): at-sea and dockside sampling data, 1993-2010 average (dotted line); for B): logbook data; average ± 95% confidence interval (grey line). For C) logbook data from 2006 to 2011, average ± 95% confidence interval.

Demographic Indicators

The size structures of commercial-size lobsters in LFAs 15 and 16 show at least three modes (Figure 6A), suggesting a lower exploitation rate than what is observed in the Gaspé Peninsula for example. In recent years, the average size has remained around 92-94 mm CL (2010 excluded). It is important to note that prior to the increase of the minimum legal size, average size was around 83-84 mm. Jumbo lobsters would previously show up in samples (1-2%) but in 2010 and 2011 none of these were observed. In 2011 as in 2008, the sex ratio was slightly in favour of females (ratio M:F = 0.7-0.8). In general, it is difficult to interpret with confidence the demographic indicators from LFAs 15 and 16 due to the few lobsters measured in recent years. It is uncertain whether samples collected, especially those in 2010, are representative of the population.

In LFA 17B, size structures have always been characterized by the presence of several modes (Figure 6B). However, they have become more truncated in recent years. The mean size for all commercial lobster decreased by 3 mm since 2008, from 96.6 mm to 93.7 mm in 2011. The decrease in the mean size and the truncated appearance can be partly explained by the arrival in high abundance of new recruits to the fishery, which is consistent with the recent increase in CPUE. However, the average size of lobster larger than the new recruits (> 95 mm CL) has also dropped since 2008, by around 3 mm, and the number of jumbos was two times lower in 2011 than in 2008. This could indicate an increased exploitation rate. In this context, the decline in large females could have negative impacts on egg production for the population. For the moment, the sex-ratio is above one, which seems suitable for mating.

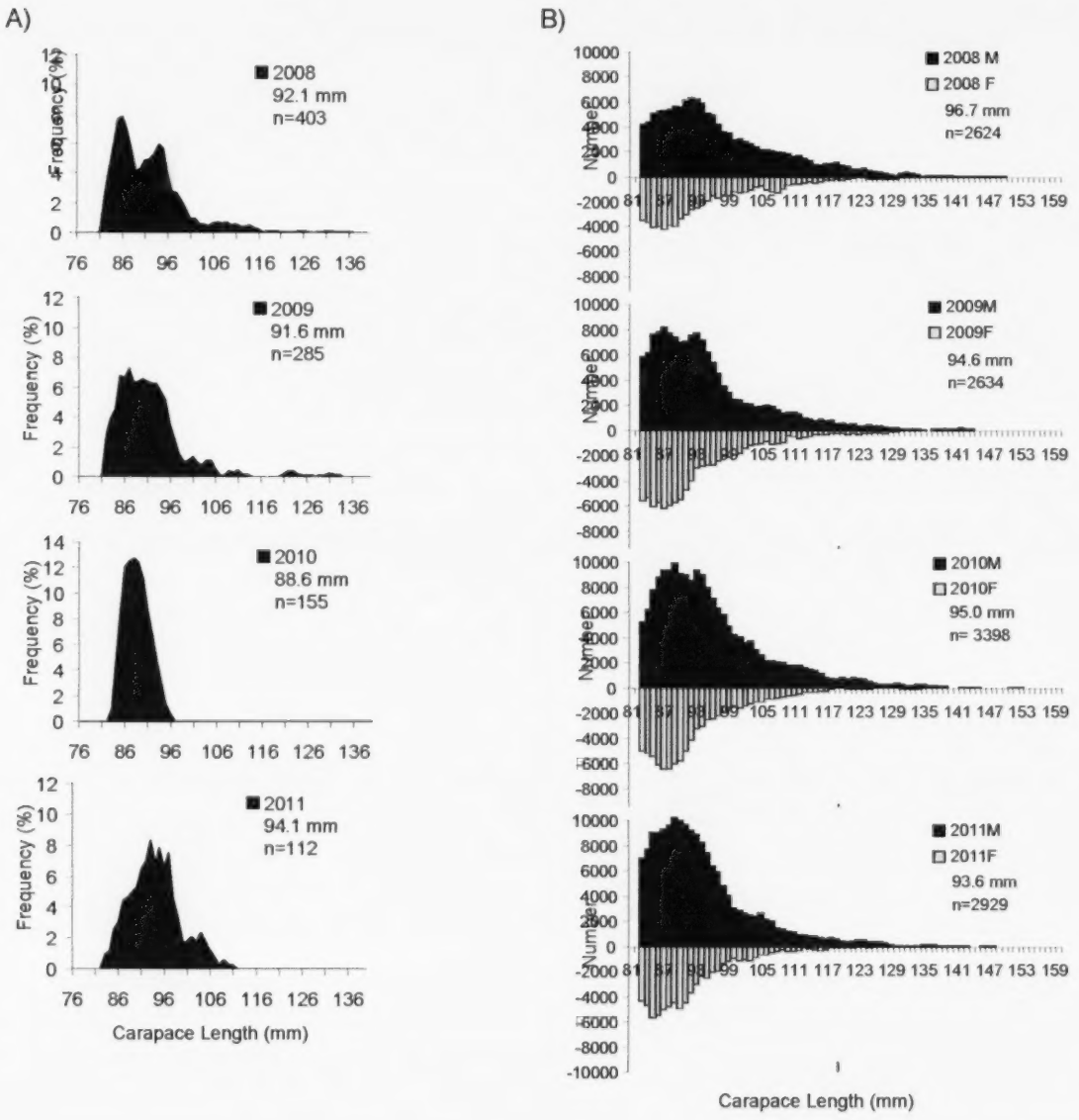

Figure 6. Size frequency distribution for lobster (commercial-size) A) on the Lower North Shore (LFAs 15 and 16) and B) at Anticosti Island (LFA 17B) from 2008 to 2011. For A), frequencies are in percentage. For B) frequencies are in weighted numbers per landings for males (black) and females (grey). The average size and number of lobster measured are indicated.

Sources of Uncertainty

In general, there is little data on lobster populations on the North Shore and at Anticosti Island. The use of logbooks should improve the quality of data on lobster abundance and distribution. However, the sampling of catches is insufficient, especially in LFAs 15 and 16. There are no indicators of stock productivity in terms of egg production and recruitment for these stocks.

CONCLUSIONS AND ADVICE

Although abundance is currently high in LFA 17B, the demographic changes observed are not negligible. If these changes intensify in the future, the fishery will likely become increasingly dependent on annual recruitment. Moreover, fishing pressure will increase on immature lobster, affecting the population's reproductive potential. Lobster abundance on the Lower North Shore is low, but has remained stable over the years. Additional information is required to better assess the stock. Generally, lobster populations on the Lower North Shore and at Anticosti Island are characterized by slow growth and late sexual maturity, making them more vulnerable to over-harvesting. It is recommended that the minimum legal size be increased to be closer to the size at sexual maturity in order notably to minimize the impacts of increased fishing pressure in Area 17B.

SOURCES OF INFORMATION

This Science Advisory Report is from the February 1–2, 2012 regional peer review on the Assessment of the lobster in the Quebec's inshore waters. Additional publications from this process will be posted as they become available on the Fisheries and Oceans Canada Science Advisory Schedule at: http://www.dfo-mpo.gc.ca/csas-sccs/index-eng.htm.

Gendron, L., and G. Savard. 2012. Lobster Stock Status in the Coastal Waters of Quebec (LFAs 15 to 22) in 2011 and Determination of Points of Reference for the Implementation of a Precautionary Approach in the Magdalen Islands (LFA 22). DFO Can. Sci. Advis. Sec. Res. Doc. 2012/010.

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